acteristic stories and proverbs concerning the birds (in one or two instances these are rendered in broken English, which is scarcely necessary, since they are not likely to have been given to the authors in that form). The nesting habits of the birds, the appearance of the nestlings and of the eggs, the times of the breeding season, are supplied, and here one gets a good deal of new information based on careful observation. Even on the subject of the Egyptian geese the remarks contain novel information, as, for example, those describing their habits as tree-perchers. Unlike the real geese (which, of course, they are not), they would seem to pass the night, not on the water, but perched on trees. Yet the nests are not constructed in trees, as is the case with some allied forms, but in shallow depressions of the ground, and after incubation the young at once resort to the water and apparently do not take to the trees until they are able to fly.

The African chat (*Myrmecocichla nigra*) is well described as a merry-looking bird, and his courting attitude is set forth in words exactly corresponding to the picture drawn by me in my own work on the Uganda Protectorate The authors rightly compare the song of the male chat to that of the blackbird. "After feeding the young he would often perch on an ant-hill near by and burst into song as if in pure joy and pride in a lusty family." These chats are certainly the most lovable birds the traveller can meet with throughout East Africa and Uganda. They are very tame, and have a fancy for frequenting native villages or European encampments. Another creature that is well illustrated by photograph and description is the beautiful paradise fly-catcher (*Tchitrea viridis*).

H. H. JOHNSTON.

CACAO-PLANTING.

Cacao: a Manual on the Cultivation and Curing of Cacao. By J. H. Hart. Pp. x+307. (London: Duckworth and Co., 1911.) Price 7*s.* 6*d.* net.

IT is a curious fact that in spite of the enormous political and financial interests possessed by the United Kingdom in tropical countries, and therefore in tropical crops and products, the technical literature on these subjects should be almost entirely exotic. There is, for example, nothing in English to compare with such works as those of Semler and Wiesner in German, or with the several series of handbooks on tropical crops published in France.

This state of things is no doubt due to the fact that serious, organised instruction in tropical agriculture scarcely exists within the British Empire, though it has been found expedient to undertake such work in Holland, Germany, and France, countries the tropical possessions of which are far less important than ours. There are signs, however, of an increased interest being taken in tropical agriculture in this country, and one of them is the occasional publication of a book of the kind now under review.

A sad interest attaches to this book, since though the author was able to see it through the press, he died before it was published. Mr. Hart was well qualified to write on cacao. During his long career in the tropics, he spent no fewer than eighteen years in Trinidad as superintendent of the Botanical Department, and in that capacity was continuously engaged in dealing with the problems that confront cacao planters. He writes therefore with a full knowledge of the needs of planters, and consequently his book is thoroughly practical from a planter's point of view. At the same time, he recognises the provisional character of many of the deductions drawn from past experience, and lays due stress on the necessity for further investigation, and makes many valuable suggestions as to the direction this should take.

Naturally the book is concerned very largely with cacao cultivation and curing as practised in Trinidad, but since that colony produced in 1910 nearly one-seventh of the world's supply of cacao, and this mostly of high grade, this is not a great disadvantage, since Trinidad practice may well be followed by planters elsewhere.

So far, practically no attempt has been made in cacao-growing countries to keep different varieties of the cacao-tree separate, and as a result most plantations contain many varieties, and yield a mixed product. In forming new plantations, it is desirable that this state of things should be avoided, and for this purpose Mr. Hart recommends, in preference to the sowing of selected seed, the grafting of good but delicate kinds of cacao on hardy "stocks." The work already done in the West Indies seems to indicate that this is practicable on the large scale.

Another equally important problem is that of the curing of cacao by fermentation. Trinidad is fortunate in this respect, since although the plantations contain a mixed population, the mixed produce obtained is easily cured, and routine practices in curing are followed, which give on the whole good results. Mr. Hart is therefore perhaps inclined to attach too little importance to this question. In British West Africa it is not so simple. There the variety of cacao grown is initially poor, and is difficult to cure properly. Further, the native farmers are disinclined to take trouble in the matter, with the result that British West African cacao is of low grade and likely to remain so for some time to come, in spite of the strenuous efforts of the Gold Coast Department of Agriculture to induce natives to improve their methods. Much of the difficulty that surrounds the production of better, native-grown cacao in West African colonies may disappear if the investigations recently carried out by Fickendey result in the application on a large scale of simpler curing methods not involving fermentation.

The two series of problems to which allusion has been made are of peculiar importance to the cacao-grower, but in common with other tropical planters he has to deal with fungoid diseases, insect pests, and depredations by animals, and on these and other equally important matters Mr. Hart gives useful and much-needed guidance. He rightly points out that cleanliness in agricultural operations is one of the best means of avoiding disease in a plantation.

The book contains a number of good illustrations of pods of the chief varieties of cacao, of tools used

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in harvesting the pods, and of typical scenes on plantations.

It should be a source of satisfaction to Mr. Hart's friends that he was able to embody in this satisfactory form his unique experience in the cultivation of cacao.

T. A. H.

A YEAR-BOOK OF SCIENCE.

Jahrbuch der Naturwissenschaften, 1910–1911. Sechsundzwanzigster Jahrgang. Unter Mitwirkung von Fachmannern herausgegeben von Dr. J. Plassmann. Pp. xv+458. (Freiburg im Breisgau: Herdersche Verlagshandlung; London: B. Herder, 1911.) Price 7*s*. 6*d*.

A GENERAL survey of scientific progress becomes increasingly difficult, and more valuable when accomplished, as the number of original contributions becomes more unmanageable. The excellent publication of which we have here the twenty-sixth annual volume represents a serious attempt to cope with an equally serious situation. To compress the 6000 or so papers by which physical science is annually enriched into some forty pages seems a hopeless task, and the manner of its accomplishment necessarily depends upon the individual outlook of the enterprising reviewer. He will almost inevitably emphasise some things which are of little value and neglect some which future developments may show to be of fundamental importance. If, however, he limits himself to such matters as have reached a certain degree of conclusiveness, if not a conclusion, he will do good work, and can safely leave the unfinished and inconclusive things to his successor.

Dr. Konen's summary of physics deals with some seventy papers under sixteen different headings, and includes such diverse matters as Lebedef's measurement of the pressure of light on gases, the controversy concerning the possibility of electric charges smaller than that of an electron, and the quantitative study of Brownian motions by Perrin, Chaudesaigues, Seddig, and Siedentopf.

The chemistry section, edited by Dr. Dammann, is mainly practical, and describes such things as Harries's synthesis of rubber from isoprane heated in glacial acetic acid; the chemistry of "Ehrlich-Hata 606," the new specific against syphilis; and the synthesis of racemic adrenaline. The astronomical section, compiled by Dr. Plassmann himself, deals with spectroscopic binaries, variable stars, Mars, comets, and the determination of time and geographical situation, picking out a few papers only, and omitting a large number of contributions of at least equal interest.

Dr. Kleinschmidt, of Friedrichshafen, deals very appropriately with aëronautics and meteorology. Other sections are presented on anthropology and ethnology (Birkner), mineralogy and geology (Wegner), zoology (Recker), botany (Weiss, a very full section), forestry and agriculture (Schuster), geography (Schotte), medicine (Moeser), and technology (Ruegg). An astronomical calendar for 1911 and an obituary for 1910 complete the volume, which, in spite of the German type used, is bound to be of great utility as a first line of reference for the year's scientific progress.

OUR BOOK SHELF.

Engines and Boilers Practically Considered: a Handbook for Young Engineers on the Construction and Working of Steam, Gas, Oil, and Petrol Engines and Steam Boilers. By W. McQuade. Pp. xv+87. (London: G. Bell and Sons, Ltd., 1911.) Price 3*s*. 6*d*. net.

THE author of this little book states that his object has been to treat in a simple, straightforward, and practical manner the various types of engines and boilers met with in general engineering with the view of providing a practical handbook for young engineers in general. Matters connected with the theory of the subject are not touched upon, or to the slightest extent only. The book contains sixty-two illustrations dealing with steam engines, steam boilers, and internal-combustion engines. The text comprises descriptions of these illustrations.

Remembering the class of student for whom the book is intended, one expects that the text and illustrations should be easily followed. In many cases index letters are not used in the drawings, an omission which is not calculated to help the young beginner. The drawings are clear as regards draughtsmanship, but in some cases are out of proportion, and a few contain minor errors. For example, a marine connecting-rod given on p. 9 has the set screws used for locking the nuts shown with the heads home against the face of the rod, thus rendering the screws useless for the purpose of locking. In some cases additional views of the part under consideration would have been useful.

Some important details are briefly described in the text without any descriptive sketches being given. An idea of the unevenness of treatment may be gathered from the fact that the action of the slide valve occupies eight pages, while a description of a set of triple-expansion surface-condensing engines shown in the frontispiece occupies one page. There is doubtless a place for a well-got-up book on the lines suggested by the author, and the present book, with considerable revision and additions, might be rendered capable of taking this place.

A Text-book of Physiological Chemistry. By Prof. O. Hammarsten. Authorised translation from the author's enlarged and revised seventh German edition, by Prof. J. A. Mandel. Sixth edition. Pp. viii+964. (New York: J. Wiley and Sons; London: Chapman and Hall, Ltd., 1911.) Price 17*s*. net.

PROF. OLAF HAMMARSTEN has resigned the chair he held for so many years at Upsala, but one is rejoiced to learn he has not relinquished work in the field where he has done such important service. Original papers from his pen still appear in the journals, and his well-known text-book continues to flourish, and has now reached a seventh German edition. The translation of this has, as in the past, been carried out by Prof. J. A. Mandel, of New York, who has performed what in his preface he terms a labour of love with his usual efficiency.

The book has considerably grown in size since its last edition; every chapter has been rewritten to bring it up to date, but the principal new feature is a chapter on physical chemistry in biology, which has been contributed by Prof. Hedin, Hammarsten's successor at Upsala. This adds considerably to the usefulness of the text-book. A book which has seen seven editions carries its own recommendation; one can merely congratulate its author, and express the hope that he may live to see many more editions through the press.

W. D. H.

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